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Educational Game for Prevention of Alcohol Use and Abuse: Nursing Technological Production

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ABSTRACT

Objective: To report the construction and testing process of **SOBERAPPY**, an educational mobile app of the serious game type for prevention of alcohol use and abuse.

Materials and Methods: Technological production of an educational mobile application built and developed through a multidisciplinary partnership approach. The construction process included the following steps: modelling and logic of the system, requirements, design, development, testing, installation/availability, interfaces, security, privacy and data confidentiality. The JavaScript programming language and Adobe Illustrator were used.

Results: SOBERAPPY is an educational game type addressing the prevention of alcohol use and abuse in adolescents. It has 23 questions presented as a quiz through a fun platform in which the player walks through four different scenarios. As the player answers the questions in the game, if he is successful in his answers, he receives feedback and accumulates points to advance to new scenarios.

Conclusion: The technology produced is creative and active, providing adolescents with immersion in the theme about alcohol in a playful and interactive way. It is expected to be used in the nursing clinical practice in order to promote health in the school context, particularly in primary care.

INTRODUCTION

Alcohol is one of the most consumed psychoactive substances in the world and the one that causes the most serious consequences for public health, being currently considered as one of the main determinants of lifestyle-related health [1].

The first experiences with alcohol occur during adolescence, even before the legal drinking age, and consumption increases with age. Alcohol is a psychoactive substance that depresses the Central Nervous System and compromises the biological, cognitive and psychosocial development inherent in this stage of development. Adolescents do not have a sufficiently mature biological system to metabolize alcohol. Moreover, cerebral immaturity makes the brain much more sensitive to exposure to alcohol, causing cerebral and neuro-cognitive damage with implications for learning and intellectual development, in addition to the occurrence of future psychiatric disorders [2].

Early start of alcohol consumption is associated with the beginning of consumption of other psychoactive substances, and

also with the involvement in several problem behaviours, namely, violence, accidents, driving under the influence of alcohol, involvement in unprotected sex, school and work absenteeism, and subsequent abuse and dependence on alcohol [3-6].

Adolescence is a period of transition marked by complex biological, physical, behavioural and social changes, and the search for new experiences and involvement in risky behaviours. On the other hand, this stage of development, under conditions that favour motivation and incentive, can be the ideal time for the application of preventive interventions [7], considering it essential that these are implemented before the first consumption experiences.

The school is the best option of context for implementation of alcohol use/abuse prevention programs, as it allows access in an organized way to a large number of children and adolescents before the beginning of the first consumption experiences. It is a favourable context for the participation of the various actors involved in the process of development of children and adolescents, and to ensure the sustainability of interventions due to the continuity of programs developed throughout schooling [8,9].

In the systematic review of the literature [10], the authors identified eight studies that analysed the impact of computer games on education about alcohol and other psychoactive substances aimed at adolescents. Six studies showed positive results in terms of increased knowledge and two had effects in increasing negative attitudes about psychoactive substances. However, there is no evidence that serious games are more effective than traditional programs because of the absence of control groups with intervention following traditional methods.

Regarding the use of mobile applications to prevent alcohol use and abuse in adolescents, two applications were identified: Rays Night Out and Alco Risk.

The rays night out is a harm reduction proposal aimed at young people whose goal is to raise awareness about safe alcohol consumption practices and to decrease single-occasion drinking (defined as the consumption of four or more drinks in less than six hours). The app invites young people to take Ray out for one night in a personalized experience where own time and drinking limits are set. The authors present as a general objective of the application to teach young people to identify their alcohol use limits [11].

Alco risk was developed with the aim of monitoring young people's alcohol consumption and risky drinking trends. It is also a relevant proposal in the context of harm reduction for alcohol consumption behaviours [12].

Considering that alcohol causes serious consequences for public health and that prevention is a strategy that ensures results to avoid consumption, especially in adolescents, the objective of this manuscript was to report the process of building and testing an educational mobile app of the serious game type called **SOBERAPPY** for prevention of alcohol use and abuse.

MATERIALS AND METHODS

The construction of the serious game called **SOBERAPPY** emerged from the intervention program "Stop to Think" already validated, as described below, and involved the following steps: modelling and logic of the system; requirements; design; development; testing; installation/availability; interfaces; security, privacy and data confidentiality.

SOBERAPPY was designed with a purpose that goes beyond entertainment. It integrates educational objectives to aid adolescents to get familiar with the theme of alcoholic beverages and their effects and consequences in a playful and interactive way. It is an educational game with rules and learning processes that differentiate it from a simple game, following what is recommended for this type of technology, giving it an organized and intentional character of learning, and yet a playful activity.14 It also presents interactive potential, as the player circulates in different interactive scenarios, offering an opportunity to initiate actions and receive feedback on the results.

As recommended for the planning of digital games [13-15], the following processes were taken into account

1) The objectives of the game concern the acquisition of knowledge about alcohol; as the players give correct answers, they earn points and move on to the next scenarios. The accumulated points motivate the players to get involved and continue the activity in order to win/finish the game.

2) Results and feedback are essential elements, since it is through feedback that the progress of the players is evaluated, allowing them to see whether their performance was positive or negative. The game offers, in addition to the scoring system, contingent feedback to each selected answer. This feedback provided at the end of each question answered (23 questions) works as a justification for consolidating knowledge, and is provided in a simple language adapted to adolescents, based on the principles of how to communicate science.

3) The presented challenge consists in the presentation of different appealing scenarios, through which the player walks and get involved in different activities (skateboarding, snowboarding, swimming with snorkels), this process is very important for the immersion of the player in the dynamics of the game in which the activities are developed.

4) The interaction is achieved through the relationship that the player establishes with the avatar, personalizing it, since he is allowed to choose his elements, but it is also achieved through the feedback the player receives throughout the process. The possibility of carrying out the activity, in small groups or competitions in teams can be created, thus increasing the interaction component. But in this case, they will be external strategies to the game. Essentially, the main aspect is the interaction of the player with the game/application itself, particularly when receiving feedback, and also the socialization provided by the activities developed along the game.

5) In the game's narrative, on the one hand, thought was dedicated to the need to integrate a system of questions presented as a quiz that would allow analysing various knowledge sets, in an accumulative way, about alcohol in an articulated way and starting from the simplest to the most complex elements. At the same time, the game integrates a context that facilitates positive emotions in order to ensure the immersion and involvement of the player. For this purpose, the rules, the objective and the situations related to winning or losing were the pillars of the game.

Theoretical Background

Recent indications suggest the use of new technologies in awareness-raising interventions to prevent the use and abuse of alcohol and show high adherence by individuals, particularly young people, to these new platforms [16-18]. Studies in this field indicate that implementation of preventive interventions in collaborative and competitive environments can be effective for learning. Learning theories suggest that the effectiveness of assimilation and retention of knowledge is directly related to the way information is conveyed. Active, experiential, contextualized methodologies based on problem situations and which provide contingent feedback are important mediators of learning processes. Thus, serious games can be more effective approaches than traditional games in the field of health education [19].

In this learning context, the game called **SOBERAPPY** is based on the program "Stop to Think" [20] to prevent alcohol use and abuse aimed at adolescents in the school context and developed and based on the model of social influence, integrating the development of personal and social skills. As described in previous studies, it is a multi-component program that integrates the following components: knowledge about the psychoactive substance (alcoholic beverages); resistance to social pressure; personal and social skills training; correction of the perception of peer consumption; safe attitudes and expectations towards substances [21].

"Stop to Think" was recognized as an example of good evidence-based practice and is part of the Tool Kit for evidence-based good practice **RARAHA** [22]. This program was developed based on a quasi-experimental study carried out within the scope of evaluation of the program [23].

Thus, principles and justifications about alcohol consumption and the practical issues that need to be worked on in the development of adolescents in order to prevent alcohol consumption are encompassed in this program.

Architecture

The mobile app has a serious game format and was built to prevent the use and abuse of alcohol. It is a technological nursing production that can also be applied in clinical nursing practice. It is a multiplatform mobile application (Android and IOS).

The main functional and non-functional requirements of the game and the components used for the development of the system are presented below.

Game Development

Requirements

The application started with the definition of the requirements of functionalities that the system would contain, in response to the theoretical framework of the game, its specific theme and the target population, i.e., adolescents and young people. The main requirements of the developed application concern the scenarios. They are composed of questions which the player must answer and accumulate points as he gives correct answers. The total sum is shown at the end. The game will be made available for mobile devices or smartphones.

Design

In this concept, the characteristics of the scenarios and characters were discussed by the multidisciplinary team (nurse, physician, computer engineer, designer), who opted for scenarios linked to the possibility of contact with nature and practice of physical activity, with a view to provide immersion in a fun environment. The first step in the construction of the serious game was its script, which started with the customization and characterization of the avatar. For this purpose, various possibilities for the creation of the avatar and different accessories were created.

Four scenarios were created: 1st playing skate in the park; 2nd snorkelling at the beach; 3rd snowboarding in the snow; and 4th skating in the city.

The visual presentation of the phases and the various scenarios were conceived in this stage of artistic conceptualization.

The scenarios present bright and cheerful colours with elements related to nature and everyday life in different contexts of physical activity/sports. Using the idea of a quiz, questions about alcohol and its effects are presented as the player plays and progresses through the scenarios. In addition to the multidisciplinary team, the creation of the game also involved the participation of two adolescents, who were 12 and 13 years old, in the process of validation of scenarios and language.

Development

The development of the game included two paths, on the one hand the inclusion of all the elements that were defined in the design stage, such as graphic elements of the character and backgrounds of scenarios, and on the other the respective programming: implementation, software development, logical mechanisms of the game meeting the functionalities defined in the "requirements" stage, integrating the graphic and playability elements.

Testing

For the refinement of the game, several tests of use and playability were performed to identify flaws and then apply corrections.

Development/installation/availability

This step consisted of installing files on the central server of Health Sciences Research Unit (UICISA)/Escola Superior de Enfermagem de Coimbra (ESEnfC) and making the application available to clients through a mobile platform.

To access the game, players are required to first download the app via Play Store (Android) or App Store (iPhone/IOS) on their mobile devices or smartphones.

Evaluation and maintenance

The review and evaluation for subsequent necessary changes may result in different versions of this game. This will expand the perspectives, content and complexity of the game, including proposals for other target populations and contexts.

Technologies used

The Construct 2 development tool, which uses the JavaScript programming language, was used to create the game application for smartphones. The visual information technology Adobe Illustrator (Adobe Systems) was used to design the images, text fonts, titles, logo, backgrounds and other graphic elements.

Interfaces

At the beginning of the game, the player is instructed to choose a character which will be his virtual representation during the game, and whose appearance can be customized by the player. In the sequence, the player goes through thematic scenarios, answering questions to proceed until the end of the questionnaire. After each correct answer, an explanatory comment and a score indicating the number of correct answers are presented.

Data security, privacy and confidentiality

Security and privacy are established through the use of a security protocol for the transmission of encrypted data and with verification of authenticity to guarantee confidentiality.

RESULTS

SOBERAPPY is an educational mobile app of the serious game type for prevention of alcohol use and abuse in adolescents. The game is developed through a fun platform, including 23 questions about the theme of alcoholic beverages (effects and consequences) presented as a quiz as the player goes through the scenarios. After each answer the player receives feedback about his performance; if his answer is correct, besides cumulative points, he receives feedback with the rationale/justification presented in clear and simple language. As the player gives correct answers to the questions in the game, he accumulates points and moves on to new scenarios; but if he gives incorrect answers to three questions, the Game Over is triggered and he has to start over.

The game starts with the identification screen **(Figure 1)**, on which the player must click on play to start the game.

Figure 1. Initial screen of the game.

Then screen 2 **(Figure 2)** shows a message that challenges the player, presenting the theme of the game. On this screen, the player can select one of three options: start a new game, continue a game; or check credits of an already started game.

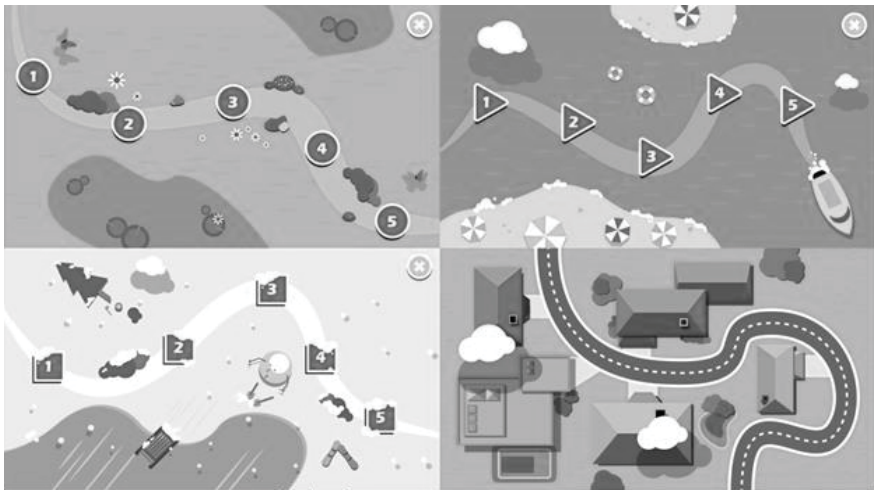

Figure 2. Screen 2- Thematic presentation of the game. Translation: "Hello, you have to solve several challenges that will be presented to you, at the same time that you improve knowledge about alcohol and its consequences. You will succeed. Have fun; Let's see how many points you will achieve?; New game; Continue; Credits."

Once the game is started, the first step consists of personalizing and characterizing the avatar (character), where the player selects the characteristics and colors available for each of the options in order to create his avatar **(Figure 3)**.

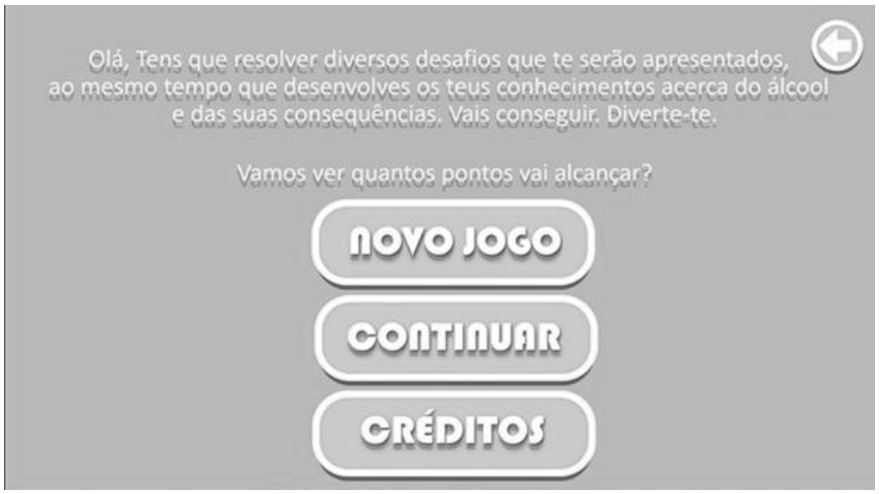

Figure 3. Screen 3- Characterization of the avatar (character).

Once the avatar is defined, the game starts. The game takes place in four scenarios which present several elements related

to nature and daily life in different contexts of physical activity/sports. The game integrates 4 different scenarios: 1st skating in the park; 2nd snorkeling at the beach; 3rd snowboarding in the snow; and 4th skating in the city **(Figure 4).**

Figure 4. Game scenarios (1st) skating in the park, (2nd) snorkeling at the beach, (3rd) snowboarding in the snow, and (4th) skating in the city.

The game includes 23 questions about alcohol that are presented as the player goes through the scenarios. The player scores a point at each correct answer. The questions are numerically identified in each scenario, with 5 to 6 questions per scenario **(Figure 4)**. Clicking on the number opens a screen with a question **(Figure 5, Screen a)**. For each answer, the player receives feedback (correct/incorrect) shown as an image; when he gives correct answers, he also receives feedback that explains the answer **(Figure 5, Screen b)**. If the player answers three questions incorrectly in a given scenario, he will have to restart the game in that scenario. Throughout the game, he receives information about the points and the "lives" he has and, at the end of the game, the sum of points appears with a reinforcement message.

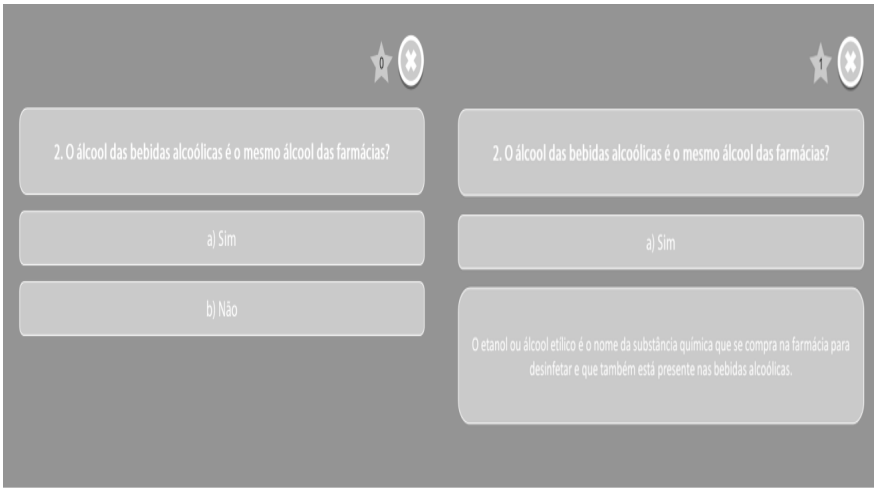

Figure 5. (a) Screen with the question. Translation: "2. Is the alcohol in alcoholic beverages the same as in pharmacies? a) Yes; b) No." and (b) screen with feedback of the answer. Translation: "2. Is the alcohol in alcoholic beverages the same as in pharmacies? a) Yes; Alcohol or ethyl alcohol is the name of the chemical you buy at the pharmacy to disinfect and which is also present in alcoholic beverages."

DISCUSSION

Alcohol consumption by adolescents is a complex problem where multiple factors, among cognitive, attitudinal, social, personality, pharmacological and development factors, which interact and promote the initiation and maintenance of consumption.26 Due to the developmental stage that they are experiencing, adolescents are more vulnerable to social influences, which are decisive for the acquisition and consolidation of lifestyle-related behaviours, both risky and healthy. Therefore, this step stands out as crucial for the involvement of students in health promotion activities [8,9,21-24].

Programs to prevent the use of alcohol abuse must be based on scientific evidence, checked for context and developed by professionals with knowledge in the specific domain of the intervention area [8].

In this context, nurses are in a privileged position for the conception, planning and implementation of programs within the

scope of promotion and prevention [25,26], harmonized according to the needs and psychological and cognitive capacities of the target groups [9], integrating the new technologies and new forms of communication in these processes [27] All these assumptions were considered in the design of **SOBERAPPY**.

Serious games provide a diversity of applications that use game technology for application in the immediate context. This possibility of reaching a large number of people at the same time is an important factor for prevention programs in different areas of health, either because of the low costs and/or the possibility of expanding their impact.

Serious games have been applied in several situations, such as in the simulation of situations that involve some type of risk, in decision making, or in the development of specific skills. In teaching, it can be used through simulation situations that require knowledge for the game to evolve. They can be applied to raise awareness of certain social problems and in different domains in the health field [17,24].

The game presented here fits the definition of serious game for health promotion. Several literature review studies describe the effects of serious games on health promotion. For example, in a meta-analysis in this domain that analysed 54 interventions using serious digital games to promote healthy lifestyles, the authors found that their use had modest but positive effects on healthy lifestyles, and long-term effects were maintained for all outcomes, except for behaviour. Serious games have proven to be effective as stand-alone or multi-competent programs, regardless of the age and gender of the players [17].

The "Stop to Think" Program [20] supported the development of the serious game presented here, more precisely through the quiz game "Alcohol - truths and consequences". It is a card game developed through an interactive methodology that promotes discussion and analysis from a set of questions related to the effects and consequences of alcohol consumption.

It is a health education and awareness session which can also be integrated as a reinforcement session after more intensive intervention programs. The session was adapted from the original program built and validated by Barroso, Mendes and Barbosa: "Stop to Think" alcohol prevention/use program [21].

The quiz follows a specific sequence elaborated based on a previous study of diagnosis of needs, which assessed the knowledge and expectations about alcohol in adolescents in the school context. There is a wide variety of knowledge about alcohol that is considered important for the understanding of this problem, such as the effects and consequences of alcohol in the short, medium and long term, and also the "myths" and misconceptions about the theme that can influence behaviours.

In the conception of **SOBERAPPY**, the entire process of creating the game was appropriate to the stage of development that shapes early adolescence, as there are differences in psychological and cognitive needs and abilities depending on the target group that have to be taken into account in order to ensure effective interventions [9]. Thus, it involves the deliberate creation of opportunities to learn, through a specific form of communication and, as it aims to prevent the use of alcohol abuse, it includes an interactive component: the player participates in the activity and as he answers the questions, he receives feedback on the result; when he gives right answers, he also receives feedback based on the justification for the answer. Through these essential elements, the player assesses his progression, allowing assimilation and consolidation of his performance, as advocated by gamification assumptions. The option for personalization and characterization of the avatar emerged from the principles of learning, in this case, related to the identification process. In the most captivating games, the construction of the character allows the player to be more involved and committed to the game and, consequently, there is better assimilation and learning [28].

The scenarios were designed to keep the adolescent involved in learning and promote greater adherence to the game and its context. Therefore, scenarios linked to the possibility of contact with nature and the practice of sports and physical activities were selected in order to provide immersion in a fun and joyful environment. Artistic elements were developed by the multidisciplinary team with the participation of two adolescents aged 12 and 13 years, following the principles of gamification: creating an environment in which the player can experience reality through relevant experiences, creating characters with whom the player identifies and feels connected, establishing a flow in such a way that the player maintains a high level of concentration, in a balance between challenges and skills to overcome the challenges, and also, which take into account the needs of individuals at different levels, namely domain, autonomy, connection, excitement, fun, fantasy or challenge [18,29].

SOBERAPPY allows immersion in an attractive and playful activity to favor motivation and determination to pursue the objectives.

Considering the high adherence of people, particularly adolescents and young people, to mobile applications [19], it is essential that nurses include new technologies as allies in the provision of health care to people, families and communities [28,29] The games for health promotion is well accepted by children and adolescents.

Thus, these adolescents constitute the priority target group of **SOBERAPPY**, and this mobile application can be a relevant tool for nurses to implement alcohol use and abuse prevention programs.

The construction of this type of product requires knowledge from different multiple fields and implies the involvement of a multidisciplinary team including nurses, physicians, and computer engineers and designers. The design of technological products in the area of health promotion represents a challenge because it implies the articulation of various areas of knowledge. Further

studies to assess the effect of **SOBERAPPY** are needed to know its effectiveness compared to the traditional program on which it was based (Stop to Think). It will be necessary to evaluate the playability of the technology and evaluate its effectiveness in postponing alcohol consumption experiences as well as in the increase in the literacy of the adolescents about alcohol. However, as a new health promotion response, its application is expected to make a positive contribution in preventing alcohol use and abuse in adolescents.

CONCLUSION

The educational mobile application of the serious game type **SOBERAPPY** developed under the coordination of nurses aims at the prevention of alcohol use and abuse by adolescents. The relevance of this technology is that it is possible to reach a high number of adolescents in a fast and sustained manner.

In the conception of **SOBERAPPY**, the entire process of creating the game was appropriate to the stage of development that shapes early adolescence, as there are differences in psychological and cognitive needs and capacities. The technology produced is creative and active. It is an educational game that serves as a teaching and learning strategy and allows the adolescent to learn about the theme alcoholic beverages in a playful and interactive way. It is expected to be used in the clinical practice of nurses in order to promote health in the school context, particularly in primary care.

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